Field Records

The theory and practice of minute observation and of accurate records. re. native plants.

W. L. Jepson

- 1932 -

Abbreviations.

– F. B. = Jepson Field Book, vol. and p. as cited.

– Types and orig. citations, note books of W. L. Jepson, vol. and page as cited.

Exploring for Plants in California

A Handbook of Directions for making field records, preparing specimens and guiding beginners in the ways of camp and trail.

By

Willis Linn Jepson

– One of the most important things in making field records is to make good specimens, thoroughgoing, complete, ample. It seems to me reasonable to think that the problems which arose before Sereno Watson and Asa Gray in preparing the Botany of the California Geological Survey related to incomplete, insufficient, scrappy material; that the defects of the work were caused mainly, largely by utterly inadequate material.

Too much, I think, is made of an achievement based upon insufficient data. It has come to be assumed as the normal way that a systematic botanist works with insufficient and incomplete mat-

trial. It is taken for granted and it should not be. If a small part of the energy, often expended without adequate results on herbarium work, were devoted to field studies — the making of complete records — then systematic botany would soon look up, in my opinion. — March. 27, 1932.

— Directions for collecting recent and fossil plants. F. H. Knowlton. — U. S. Nat. Mus. Bull. no. 39, Part B.

— It is important, in California, to collect at other than the spring flush or even the autumn peak of flowering. Collecting should be done at the "ragged times" of the year — otherwise you lose phases in the life history that are highly significant. Take

the herbage when it does not make "pretty" specimens and rewards will be thine. — When one is traveling in good country for collecting, or when one is travel weary, it is very easy to disregard thistles. No one collects them scarcely if he can avoid it. And so when, traveling in the hill country of western Glenn Co. I saw a fine and very prickly thistle (no. 16,312) by the way I stopped and collected it, though I did not have any enthusiasm about it. However, I felt very virtuous about not passing it by. I always do, (very virtuous, except in the case of the largely innocuous C. edule. — F. B. 51:189

— When a man gets off this horse he should loosen the cinch, move the blanket, and allow the horse's back to cool. — Henry Miller in the "Cattle King", p. 256.

— No proper study of plant geography can be made in Cal. until plant distribution is known. There should be plant catalogues (based on types.) of many natural areas in California or of the counties. How well I remember the fat headed rulings, the superior criticism of mere lists of mere catalogs. They are extremely important. So far was this spirit carried that journals would not index lists. Zoe says on its index in the book "Simple lists not indexed", thus the most valuable portion of certain contents is unavailable. — June, 1932.

— A good collector: cf. "Notes on the Botanists of Cal. & West Am." p. 102.

— cf. T. B. 36: 181 et seq.

Collectors are born, not made, in a great degree. A sheer instinct for collecting carries a man far. He must have an inborn gift for knowing where to look and how to treat what he finds. A natural bent may undoubtedly become highly cultivated; slight powers may, doubtless, be improved by intelligence and diligence.

— How I have struggled to get Brandegee localities! I have put down under years the date and locality in those cases where there chance to be on the herbarium label. Twenty years ago I wanted to know the location of Ironwood Well!!

— Numbers should be used in numerical sequence and for the purpose of identifying a particular collection made at one time in one place. Number should never be used again for another collection. Numbers should not be used to

indicate botanical relationships. The same number should not be applied to two different collections at different seasons of the year, even if made in one spot and with the belief that the specimens represent one species. The scientific name should take care of that, or it should be stated. Nos. 220, 315 and 333 are regarded as one species. One should not use a number to designate a given species, that is, one should not say give the number 1620 to Brodiaea capitata wherever one collects it about the state in whatever year. These seem like un-necessary cautions, and yet just those things are done. The reserving of a number for a particular species is

especially annoying.

- Cf. F. B. 41:162.
- Directions for collecting specimens. by F. V. Coville (Bull. U. S. Nat. Mus. no. 39, — 1895. Part I). See separate sub "C".
- Cf. letter to Mrs. H. A. Egan, circa '32.
- Directions for collecting and preserving plants. L. F. Ward. Bull. U. S. Nat. Mus. 22 (1882).
- Notes on desert camping. Nature Mag., 21:127 (Mar. 1933).
- Numbering specs. It is easy to jump numbers or to repeat. The State Survey people [Cal.] jumped unconsciously from 5099 to 6000 and went right on. See Brewer - Bolander Field Book. see p. 8 seq.
- Plant labels of J. G. Lemmon. F. B. 39:40.
- Bolander, H. N., F. B. 39:39.
- Fares, M. E. His labels are pretty fair and intelligible, but he often does not specify, as "Hot Springs." See p. 9.

— Probably few persons have ever numbered specimens without slips. Every time that you see an "a" appended to a number, that means that there has been a slip, ordinarily. See p. 7 ante. It is very easy to give the same number to two different plants. If one is numbering straight along it is easy enough. But if there are 2 or 3 or more or a variable number of sheets to be given one number, then one must notice and check.

— Greene, E. L. He never told us, his students, how to press plants. I supposed he expected us as intelligent observing youngsters to go and do likewise — as we saw others do. At any rate he never stressed the mechanical

side, although he often criticized us for collecting scraps or too scantily. Apparently, when we got a thing that was "common" in a spot, we concluded it was well enough known. How severely he retorted on us when we made that plea; neglected to get the root-system; or failed in sufficiently illustrative material.

— Jones, M. E. "Hot Springs, April, 1882", California. Quercus tristaria. Jones always has a label for his plants. His failure is in specifying county in the case of common place names.

— cf. V. E. Shelford, Jan. 26, 1922, in litt. as to preservation of natural areas. See also printed pamphlet by V. E. Shelford.

– Completeness of observation.

"Incompleteness of observation is another common danger. The eye tends to pick from the landscape that which seems to it for the moment significant, and fails to note much that later stages of the study may show to be vitally important. Even where the initial observation is fairly complete, the benefits which should be derived from it may be lost through failure to record permanently in memory and in note book all the facts observed.

No one is wholly free from the dangers of defective observation. But one who acquires the habit of analyzing his observational powers and processes is less exposed to these dangers than are those who give no conscious attention

to this initial step of a scientific investigation." – D. Johnson, Sci. 77: 577.

– "Miserum et ferè defloratum specimen". Thus speaks J. D. Choisy disconsolately of his material of Cuscuta californica, on which he bases his description of that species as new (Mem. Soc. Phys. et Hist. Nat. Geneva 9: 279), in 1841.

– When C. Epling came back to California from the Missouri Botanical Garden he boasted to that he had made his Monardella [H.E. Mellinn] monograph without ever seeing a living plant of the genus. – H.L. Mason, Jan. 3, 1934. To me this is utter heterodoxy. – W.L.J.

– It is extremely desirable as a practice in field work to collect representative material of the species in its best development, in its most successful state, in the form which marks its dominancy. Mere stunted dwarfs are usually not worth while to collect. All species have such states that fail on account of sterility – or may fail from lack of water say, as seedlings. But caution should be exercised not to pass over things which are not mere dwarfs but are real states in themselves. It is not likely that Lupinus ornatus is as rare as appears from herbarium material. It is the easiest thing to pass it by as a

stunted or underdeveloped state of some other species, whereas it is normally small and wiggly looking. It is rare species. Cf. also Eriophyllum multigenum, – invalid looking.

– How seldom do persons give the locality for a plant collected. Judge W. Gray collected the rare Quercus morehus in 1908 in the Kanzah region but gave no locality. It is more important that the plant have a local habitation than a name, for the name of the plant may be supplied but not the locality or seldom, if not given in the first place.

– Galton, Francis. The art of Travel.

– In the collecting of scraps there is an element of the weird not to be overlooked – the element of a puzzle, a mystery, an enigma – and therefore exciting curiosity or wonder.

All this would not happen if the specimen involved were ample, say a series showing well the life-history and accompanied by all necessary field facts. All truly scientific systematists should resist this encroachment on the pure scientific field. The determination or possible determination of a scrap, or a determination so-called which is impossible of proof or disproof — there is often a glorification of this out of all proportion to its importance or value. Work of this kind, based on inadequate material or facts, should be avoided by competent botanists or refused.

- Burrance for the spm. cf. "Systematic Botany" Note-book, p. 103.
- Collecting. See Sys. Bot. note book, pp. 70, 83.
- See letter to L. N. Lorenzen with spm. of Styrax californica Torr.
- No naturalist travels in crowds. He travels slowly. "He who goes slowly goes safely and goes far."* The field of systematic botany is not for those "who want to arrive before they get there".
- F.B. 52:103, camping early. 52:97, need of water.
- Scrappy material. cf. "Notes on the Botanists of Cal. & W. Am." p. 55.
- Single individuals. F.B. 50:71, at bottom of page.
- F.B. 1:66 (Asa Gray and the field).

* Italian proverb.

? Jepson Corr., vol. ?

– cf. Fansley, A. G. Practical Plant Ecology.

Fansley, A. G., and Shipp, T. F. Aims and methods in the study of vegetation.

– cf. "Systematic Botany" Note-books, p. 84. Also p. 70.

– Skimpiness of material. A. S. Hitchcock would have saved himself embarassment if he had insisted on good material as I insisted to Dr. Bartholomew that I must have ample material of the grass at Riverside. cf. Jepson Corr. 30:48-52. My comment on the incident is in "Systematic Botany" note book, p. 70. See also my letter to Dr. E. J. Bartholomew, June 19, 1931, in "omissions" file.

– Letter to W. S. Cooper, vol. 32, p. 170 of Jepson Corr. in which is pointed out that the time and money spent on

imperfect material were better spent in sending an assistant over his ground again. This letter was in 1932.

– cf. F. B. 44:193.

– For an amusing example of exactness of statement in recording a locality, see letter from W. I. Follet, Mar. 19, 1934 (Jepson Corr.).

– cf. F. B. 46:123.

– cf. F. B. 52:99.

– cf. letter to Mrs. C. E. Wallet, 5-15-34.

– cf. letter to Mrs. C. F. Rose, 5-11-34.

– Some men use a short hand in the field. It is thus important to have a record of their symbols. Shockley, for example, used a good many brief signs. When he wrote "428 BC.", that means his no. 428 collected at Bishop Creek, Inyo Co., California.

– Disposition of duplicates. cf. John Lindley, Introd. to Bot., p. 468 (1832).

It is necessary to be constantly on guard against the practice of collectors who send in plants from their home town and do not indicate specifically where the plants were collected. I. T. Wrecks of Brawley, who finds mighty interesting things in the desert, sent me Oenothera cardiophylla var. longituba (or var. splendens M. & J.) from Brawley in 1928. I cited his specimens as Brawley in the Flora of California manuscript. In 1934 he sent me a map with various stations ringed on it indicating various rare plants that he had collected at those stations. The Oenothera above, he named collected at Bell Well, we.

of Niland. But how many times does one never find out such a fact from a collector, so that error becomes long-perpetuated in this way. - May, '34.

- H. W. Peirson, who is an almost unsurpassed collector, refuses to number his specimens in sequence of collection. He numbers them serially to be sure, says this, in collecting the same thing (or what he believes to be the same thing at the same station) he either gives the collection the same number as the collection previously made there. For example he collects a Cotyledon at Johnson grade, San Bernardino Mts. and numbers it 8972. Then in

1933, at the same place presumably, he collects it again and on his label I find "no. 8972 in 1930".

— Advantage of detailed field record: peculiar corolla of Adenocaulon bicolor, see fig. 951, Man., never recorded before. Obscured in dried spm.

— Collect vegetative shoots. Such shoots in foliage and habit often very different from reproductive shoots as to leaves. Such material adds to the knowledge of the life history. Rosettes, from the ground, may be very instructive and are best taken, often, before the erect shoot is developed, say in midwinter or earlier.

— To the young collectors: Go forth eager and bright with speculation and enterprise.

Expeditions, Pedestrian Trips

From about 1905 to 1915 or 1920 there was much in vogue amongst pedestrians and mountaineers a shoe-leather called Napa-tan. It was cow-skin or rather hide tanned by means of one of the finest tanning agents in the world, the bark of the Tan Oak (Pasania densiflora. Lithocarpus densiflora) It is a leather exceedingly strong durable and firm, and yet very soft and pliable as shoe leather. It made up into a fine-looking tan-colored shoe which was extremely reliable for all sorts of activity in the open and well-nigh indestructible. One pair of these shoes I had by me for twelve years before they were finally discarded. During the "depression" this shoe went

out entirely, apparently, since the people having little money demanded a cheaper shoe. There was a report some years ago that manufacturers of other shoes had bought off the Mapa-tow concern. This was given as an explanation of why we no longer could obtain these shoes. — Jan. 4, 1935.

— Collecting directions: cf. letter to Allison Kramer, Jan. 18, 1935, in Jepson Corr. vol. 36.

— Collecting. F. B. vol. 51, pp. 188, 189, 190.

— "Descriptions drawn up from living plants are so far superior to the ordinary run of herbarium-made diagnoses." — E. L. Greene, Pitt. 2:92.

— Collecting. cf. index to Systematic Botany notebook.

— Bolander, H. N. His failure to number serially. cf. "Botanists Cal. & W. Am." 1:191.

— Scientific Expeditions, their instructions and field work.

1. Instructions to A. Menzies of the Vancouver Expedition by Sir. Jos. Banks.
2. Sulphur Expedition.
3. Beechey Expedition.
4. Kotzebue Expedition. Compare Cal. Ranger, 6:6:1 (Jan. 4, 1935). *
5. Malaspina Expedition.
6. La Perouse Expedition.

* N. T. Mirov emphasizes the phrase of Kotzebue, "thickly wooded" (Sacramento Valley) without knowing that in certain spots along and below certain rivers the plain would appear so. — W. L. J.

— A highly important fact in the recording is the exact locality. It is odd how extremely difficult it is to get localities out of casual collectors. An interesting fragment is brought in — and I try to get the station for it from the collector. It is often extremely difficult. Apparently some of them feel that they have found a great rarity and they wish to preserve the secret of it for themselves. As there may be some other folk nearby. Sometimes I get around their reticence by bringing out a map and suggesting localities on the map. Sometimes they write in / By letter to me A man wrote me about a weeping form of some native tree in 1934 (?) but evidently wanted to conceal the locality).

Advice to young collectors:

Do not hesitate to collect on old ground. Think not some previous collector has gotten everything. If some one says the ground has been worked over, fling back at such men that Nuttall collected at Monterey a few years after David Douglas and got many fine things. Contrariwise he did not get the Redwood! It is an obsession of small minds that because some one has botanized in a region that nothing more is to be done there.

— " —

1. Go into field and find out what species are there. Importance of basal work. Jos. S. Adams had to travel to find out about Arctostaphylos. He could get nowhere in the herbarium One of my very able students.

2. Names only of secondary importance at beginning. Find out about the plants!

3. Types, study of, must be delayed until full knowledge of the species is available. Otherwise the types will either mean nothing or be misinterpreted.

— Peirson, F. W. "He [illegible] collected a spm. the second time in fruit at same or different locality and fastened the later spm. with the flowering specimen, without giving the second spm. a new number or separate number" — acc. Jos. A. Ewan, in 1935. I myself was, of course, well aware that Peirson did this. Even worse, Peirson put his own herbarium number on sheets of another collector, even though that collector have a number of his own! — Value of field notes. — Notes on species made in the field are of very enlarging value; the account of a genus may be quite transformed; even notes on one species may challenge the whole set-up of a genus and lead to effective reconstructions.

— Material for a flora. cf. letter to Ira W. Clokey, Feb. 18, 1940.

— Immanuel Kant, re. dates of narrative. cf. F. B. 57: 162.

— cf. F. B. 43; 463, 464.

— Importance of taking the whole plant. The root is as much a part of the plant as the leaves. I turned up a spm. of Mertensia longiflora from Modoc County. I determined it with some trouble to be M. longiflora never before known from Cal., certainly at that time new to Cal. for me. Now

tuberous roots. This specimen was destitute of underground organs. If the specimen had been complete, the determination would not only have been easier but much more satisfactory. The collector = L. S. Smith, no. 1083 in 1919.

Whenever I discover an error in my Field Book I eliminate it. The error is erased completely from the record. It is more convenient to cancel an error by drawing a line through it and this is the practice commonly followed. It is, however, not the best way. Errors may be subtle. I once had the experience of drawing a line through an erroneous statement, later concluding that the cancelling was a slip, only to discover still later, when just the right stages of the organs development was again available, that the original statement was in reality erroneous. One may fluctuate any number of times in a case of this kind. Even, in general, the retaining of the stricken record may lead to doubts or debates. And so it is

my rule to erase completely an erroneous statement when it is spotted. James Rennie, my companion on a canoe trip down the Colorado River, in 1911, noticed that I would occasionally write a few words in my Field Book with a lead-pencil instead of with ink, a thing that puzzled him; nor did he, I fear, quite understand my explanation. The rare pencillings were to replace ink-written words as soon as the evening hour arrived when settled in camp.

- Field labels. See Misc. Circulars Box. File No. 4.

—. Indifference to locality for a spem. See my remarks about the Gray and Watson (servus) who often did not cite a locality when they had it, but gave range. (Bf. Types and Orig. Cit. 2:178). Trelease did the

same thing. Compare his paper on Epilobium in 2nd Rep. Mo. Bot. Gard. In indicating range of a species he may say California and put in parens after it the name of one or more collectors, but not giving a locality. The result is that actual localities for Cal. plants are relatively scarce in the literature.

- Numbering of specimens in the field enforces an accuracy which is not to be had by any plan of not numbering. Numbering serves as a constant check on accuracy. But it must be done in the field on the folder at the time the plant is laid into the field press.

Uniformity of Labels

— Labels of duplicates should be like the original or unicate, or contain essentially same data.

Geo. D. Butler sent me his 648, Ornithera gracilifora H.T.D. "Near Wertzel's field on road to Humbug. April 14, 1909" on the label. The label in his own collection he wrote "Dry hills near Yreka", the date and number being the same. Actually the two localities are the same, but one does not know that "Wertzel's field" is near Yreka.

— "For not only are many specimens deceptive, often badly dried or poor in other ways, but even those plants that are living; so that it not rarely happens that excellent botanists have published this or that new species, but later acknowledged it to be only a variety of a species already known". Roemer & Schultes. of. Rhod. 4:371.

Importance of Locality.

— The exact locality for a collection is important. The locality represents a fact of basic importance. E. Braunton sent me, once, an interesting lot of plants, fair specimens, labeled "Arrowhead and Big Bear lakes", Aug. 1931. These lakes are quite a distance apart and on account of precise station, associated species and local distribution, it makes a great difference whether collected in the one place or the other. So I sent a query and he replied that all were collected at Arrowhead Lake save certain ones which he named. I hope he was not too casual in this reply.

— A patient pursuit of facts and a cautious combination and comparison of them, is the drudgery to which man is subjected by his Maker, if he wishes to attain to sure knowledge. — Thos. Jefferson. (cf. Journ. Hered. 35:173)

– The State Geological Survey had a printed plant label as follows:

Geological Survey of California
State Herbarium

Coll. H.M. Bolander, No.
186

Name,

See Potentilla divrsifolia sheet in U.C. hb., Brewer 1708.

– I further admonish all who have any knowledge in these matters to write it down. Do it truly and plainly, for the sake of those who seek and are glad to learn, to the great honour of God and your own praise. If I then set something burning and ye all add to it with skilful furthering, a blaze may in time arise therefrom which shall shine throughout the whole world. – Albrecht Dürer. Presumably

[Cont. p. 187]

In numbering specimens, folders, in the field, one may sometimes duplicate a number or skip numbers. This is not important at the moment if the numbers are checked up and verified without undue delay, as always they should be.

H.M. Bolander, California Geological Survey, in his field book, after numbering a collection 5099, numbered the next one 6000. Later he discovered it and wrote: "Mistake in numbers. Lost 901". It made no difference, of course, in this case as to accuracy, since there was no duplication of numbers.

– Recording Localities on Specimen Labels (Walker). Chron. Bot. 7: 70.

Collecting Places

1. There is much entirely new area.
2. Cemeteries; railroad rights of way.
3. Old ground. Often yields richly.

The fallacy of supposing that S.B. Parish exhausted the San Bernardinos.

4. Classic localities in order that topotypes may be secured.

— A weak solution of hydrochloric acid, about 5 o/o, will, says Jos. A. Ewan, serve to preserve the color of white orchid flowers such as those of certain Habenarias.

— Technique is as important in systematic botany as in plant-physiology or cytology. Always I emphasized technique and impressed upon students the necessity of securing proper equipment for the laboratory as for the field. There is a high degree of technical training needed in the making of proper specimens. In my day I made students buy their equipment before enrollment. No equipment, no enrollment.

J.A. Ewan tells me that Dr. A. J. Johnson of U.C.L.A.

emphasizes this point to students and says as much technique is as necessary in taxonomy as in cytology say.

— cf. "Records for Specimens", Systematic Botany Notebook, p. 84. "Collecting", p. 83.

— In selecting specimens — one should take "pure" material; material which is free from foreign matter; all alien stems, leaves, roots should be weeded out.

— Character of specimens of various collectors: cf. "Botanists of California and western America" notebook, p. 55.

— Specimens may well be trimmed in the field before putting in press. Frequently it is necessary and does not in many cases change or lessen the value of the resulting specimen. But the fact should be noted in the field book, as, only half of

individual taken, or lower branches mainly removed.

— One must as a field observer develop a special state of mind for each part of the state, a particular slant, a habit of observing suited to the new region. Seeing new things is a quality for each region; the Colorado desert with its open vegetation is different from Humboldt County with its dense tangled masses of many species.

Good-looking Specimens

are a scientific asset. It is not a matter of prettiness or the lack of it. But if the plant put into press is arranged naturally, if there is no confusing or unnecessary over-lapping, if leaves are spread out properly, if the plant is well dried — then all

this serves good scientific ends, wise scientific purposes; It is important that the worker on the plant obtain or be able to recall as completely as possible the character of the plant as a living organism. — Oct. 15, 1936.

— See letter to Mrs. Susan Delano McKelvey, Nov. 18, 1936; re. errors as to locality.

— Mrs. C. F. Rose has sent in some dried plants marked "20 miles northeast of Redding". Nowadays I dislike such indications. The road station might is very near 20 miles on the Almiras road, the road she was on. It is, however, a not uncommon practice, but it is objectionable. One might as well say "100 miles east of San Francisco". — Nov. 24, 1936.

— Collecting Cacti for Herbaria. Lois Chambers Taylor. Cactus & Succulent Journal 8:110. 1937.

— Collecting grasses: cf. F. B. 56:106-107.

— Studying plants in field before collecting: cf. F. B. 56: 86-87.

— [If a specimen sags in the folder when picked up — drying stock — or a leaf droops, the plant is usually still wet.* Plants or plant parts may stick to collection folders when being dried. Do not tear them off when transferring to permanent sheets because the parts will be injured. Work the back of the folder with the thumb or forefinger to loosen the organs without injury. drying specimens.

— Field notes lack value without supporting specimens. cf. F. B. 56:161.

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*If the stem is, or base soft or wet, or the leaf, it is of course not dry.

- cf. letter to W. A. Carlson, 3-3-37.
- cf. Systematic Botany note-book, p. 79.
- cf. F. B. 11:168; 11:169. 12:188.
- cf. indices to F. Bs.

- Search out the habitats in a region and then look for your plants. One may thus extend ranges and find unexpected materials.

— A great deal depends, in collecting, on little things: string; a field knife; a digger. And it takes a long time to learn the arts of a good collector. Always collect on the outward journey; never neglect a plant saying you will get it on the way back. Always place plants in folder; don't just thrust in with the idea that the plants will arrange themselves.

"When I collected, being shy of newspapers, I sometimes put two species in one sheet; or in other instances discarded material from a sheet and used the same sheet over again, neglecting to cross off numbers not used." — L. S. Smith in 1927, in reply to my query of Feb. 25, 1927, in which I say: "There are often two distinct numbers on your sheets."

- Making an Herbarium. Alp noted at Kew.
  Pulteney, p. 33, 48, 49, 50.
  Philosophia Botanica.
  Rose, Elements.
  Lee's Botany.

- Phacelia distans and P. ramosissima are sometimes distinguishable only with difficulty in the case of flowering branches merely. But if specimens of P. ramosissima are taken with the root (perennial! — a heavy root-crown), evidence is furnished which is incontestable. So, accumulate evidence, evidence, evidence! facts, facts and more facts!

— Sir Joseph Hooker. His field book. cf. Types & Orig. Cit. 2:127.

— Pliny the Younger says the mind becomes active in the open "It is wonderful how the mind is stirred and quickened into activity by brisk bodily exercise". — Letters, p. 9.

— Busick, Wm. C., distributed plants with printed labels in 1898. No locality except the printed heading "Eastern Oregon", no date save 1898. cf. his Monardella odoratissima Bth. in U.C. hb.

— Lemmon, J. G. He made in company with Dr. C. C. Parry a journey from the San Bernardino Valley to Yosemite Valley. The plants collected on the trip he distributed under a printed label for each species: for example,

— "Gilia atractyloides Steud. Crafton to Yosemite Legit J. G. Lemmon."
[Lemmon label, U.C. hb.]

No date; no specific indication of locality. This species was almost positively collected at or near Crafton in the San Bernardino Valley! — and may not be found anywhere between Cajon Pass above the San Bernardino Valley and Yosemite!

— Agave flowers. are borne high in air on stalks 10 to 14 feet high and often not collected. There has just come in this moment, from the Providence Mts. a [July 7, '38.] fine box of flowers from Mary Beal. She sends units of the great panicles, dense clusters which have traveled

through the mails perfectly. One very fine cluster, flat-topped, carrying above the perianths a mat of prominent stamens and the long-exserted styles, I have put into a jar with formaldehyde solution to be drawn by the artist, Virginia Long Bailey, when she returns in the fall. — July 7, 1938.

A. convexiata probably — the fls. fleshy and therefore carry well.

— A specimen of a plant collected is of little value unless there is associated with the specimen certain facts regarding its origin — habitat, locality, date of collection, collector. These represent the minimum of facts. But it is very difficult to get an amateur collector to send in the locality with the specimen. Ordinarily he will never do it. If its importance is pointed out to him, he thinks it sufficient to send it in afterward. The difficulty about that is in getting the proper locality tied in with the proper specimen — although this is extremely easy in the beginning — to tag a specimen or put a label in a folder. I am moved to this memorandum by the real rarities that are now being sent in by Charlotte N. Smith of Woody, Greenhorn Rts., Linn Co., Ore. July 6, 1938.

— Pressed specimens. cf. F. B. 44:22
— Stinging specimens. cf. F. B. 44:27.
— Notes of travel. F. B. vol. 44.

— The ethical point in specimens deliberately made imperfect or falsely representative.

1. Jones sends unlike material from one bush to an eastern botanist.
2. "Actinolus simeneris", a fraudulent plant. cf. F.B. 55:66

— A traveler should be a botanist, for in all views, plants form the chief embellishment. — Chas. Darwin.

— Dates on specimens. cf. F.B. 57:162.

— Numbering specimens, F.B. 51:9.

— F. A. Rodgers. Botanized by rail in S. Calif. Had a private car put on a siding. — F.B. 51:10.

— Rarities, F.B. 54:196, 176.

— Fosberg, F.R. Plant collecting manual. Philadelphia. 1939.
cf. Tax. Index, vol. 2, no. 4.

— It is so easy to duplicate numbers in making field records — in numbering specimens. Bolander, who was careful makes two number "2467", one for a plant collected at San Francisco, the other for a plant from Tamalpais (Gentiana oregana).

— The inspiration of field work:
cf. my letter to Prof. Martin Flaherty, May 11, 1935.

— Certain plants easily overlooked:
cf. F.B. 45:102. Mimosa quadrangularis; Sagina apetala

— B. L. Robinson surveyed the fine aquatic plants which Walter Deane had with such long and studied pains collected, dried and mounted — making a quite matchless collection. Whereupon

after some discussion, Robinson asked Deane to make a set for the Gray Herbarium. Deane made some friendly but non-committal reply and turned to me afterwards, saying: "Dr. Robinson has no conception of the amount of labor spent over the years in preparing those sheets!"

— A fine year in the desert and in arid places and its stimulations. — Letter to Martin Flaherty, May 11, 1935, in Private Correspondence.

— A good walk clears the mind, stimulates thinking. — John Huston Finley.

— The Clear Lake region. cf. letter to Carl Purdy, 1-6-'38.

— cf. Systematic Botany Notebook, p. 86; p. 83, and perhaps elsewhere.

— Methods in the field. The collector must learn species in the field. No better place to learn them: by comparing rigidly individual with individual until a sufficiently large number have been compared to establish in the mind to get a working concept of that species: both as to differences between individuals, and the nature of the differences (the differences always change from individual to individual), and the resemblances which are found in every individual with slight, if any, change.
cf. Sys. Bot. Notebook, p. 87.

— cf. F. B. 39; 188.

— Seemingly rare plants can be collected in sufficient quantity: cf. F. B. 45:94.

— Fragile underground stems. cf. F. B., 58: 478.

— Rarity. cf. F. B. 58: 484.

— Plants with obscure or small fls. may escape attention as being reduced or immature forms of well-known species. There are many species of Phacelia which look much alike. It is possible the very delicate small-flowered Phacelia eisenii was long overlooked, possibly because thought an immature state of Phacelia curvipes or some other species.

— Gray, Syn. Published Phacelia phyllomanica Gray and its var. interrupta Gray (Proc. Am. Acad. 11:84) without any indication of country, locality or collector.

— When a young collector begins to collect he should plan always to collect some duplicates for distribution. But whatever he gathers should be accumulated

with the idea that such material belongs to the world of botanists to be used for the furtherance of botanical science, either by readiness of loan, by distribution as gift, or by the practices of exchange.

— A great many amateur lovers of the native plants have, in fifty years, sent material for determination. Some of these persons, especially women, have a real intellectual interest in their local flora. It often happens that just to the degree that they are brainy they are incapable of making proper specimens. Their interests are purely intellectual; but they cannot work physically. Their brain is strikingly active about the plant; but they have no trick of using their hands in making specimens. They

develop original ideas*; but they cannot or do not know how to take pains to make good specimens - specimens which will illustrate the biology of the plant. Good instructive specimens means taking pains - and more pains and still more pains. Because specimens, should by every test of a botanist, should be instructive - instructive in themselves and in the factual data which goes with them.

- Phacelia circinata var. calycosa Gray, Proc. Am. Acad. 10: 317. Gray gives no locality or collector, not even the country in which found.

- Collecting data, absence of. cf. my letter to W. A. Dayton, May 8, 1938.

- Johnston, I. M. Prep. of bot. specs. Arnold Arboretum. c. 1939.

* cont. p. 159

- Specimens should be prepared to look as natural as possible, as nearly reminiscent of the living plant as may be. cf. letter to Dr. Lincoln Constance (7-7-'39) who has made very fine sets of Nemophila - botanically beautiful; inspiring to work on.

- A sheet of Ellisia nyctelea (Univ. Cal. Herb.) is much discolored (Ruth Nelson 1229). The reason is that a bunch of plants were probably taken and put in press without separating or spacing the individuals.

- "A local habitation and a name." If authors would only give details of the plants' habitat, a named locality, it would add so much of value and interest to what they write or publish.

Lake Congdon. His Mariposa County lists were the first ever published for Mariposa County. The lists are most useful but they would have been vastly more interesting and valuable if he had added localities for his species, or even one locality for each.

— It is necessary for the collector in his field book to write clear English so that there be a definite meaning and so that only one interpretation can be placed upon it. Such writing requires thought and care and attention.* Get into the habit of repeating key words that are subjects of sentences, instead of using relative pronouns which may be, in a given case, foggy or impossible as to antecedents. Read the

* See also p. 59.

paragraphs on this matter written near two hundred years by Philip Dormer Stanhope in "Letters to his Son". This is no grammatical treatise but a warm human document composed by a father tremendously solicitous for the success in life of his son.

— A practical drier for botanical specimens. J. T. Buchholz. (Trans. Ill. Acad. Sci. 24: 103-107. 1931.)

Poor Locality Records.

1. Duncan Horse Camp. Even though the county, Modoc Co., is given, it is a vast county and besides a horse camp is likely to be a transient spot. (Used by J. T. Howell).

2. A locality given as Los Angeles Co. A locality given as San Bernardino Co., which is not unduly so vast but is both cismontane and transmontane.

3. A locality given as Santa Clara Co. This may be either outer Coast Range or Inner Coast Range.
4. Localities should in certain cases, to be definite, be localized by reference to a natural feature, as a mountain range, a valley, a creek or river basin.

Root system.

There has been so much collecting without any gathering of the root system !! And yet the root is a highly important organ of the plant — and so are all underground organs such as bulbs or rootstocks or stolons.

Recently I looked a very large collection of dried specimens of Anemopsis californica in the University Herbarium. A surprising number had no rootstocks at all, only a few showed rootstocks and roots — and these inadequately. I was much struck by this incompleteness — because a consignment of the plants showing rootstocks and roots had just been received from a pharmacist at Escondido in San Diego Co. These fat rootstocks gave a new idea of the plant. Moreover the rootstocks were important to the pharmacist ! — 9-16-'39.

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* Cont. from p. 57. It is a help in being a citizen of the world (and one must be a citizen of the world if you are to be a real scientist) to know one or more foreign languages. We are the most understanding people on earth and tend to be proud of it. We call Signor Mussolini names. His political philosophy I abhor but remember one can learn from every successful man that ever lived. When Mussolini first came to power he saw that he needed languages and he learned German,

— see over —

French and English. It is not so easy to acquire a speaking power of a foreign language after you are mature. The real time to learn languages is when you are very young. Nevertheless Mussolini did. Let American copy our first citizen, Benjamin Franklin. How could he have ever been our most successful diplomat abroad had he called foreigners names? He was wise. He knew virtue must be appraised in men as well as vices; for if you don't, one can be deceived as quickly maybe by virtues as by vices.

— A wood rat or a squirrel made away with my needle-scalpel from my rough work bench in the woods in Meadow Valley, Plumas Co., in 1939.

— In drying separate very coarse plants from thin ones in the piles.

— In describing: Do not put first the exceptional or unusual condition; put first the prevailing condition.

— Collect the dead leaves on stems with the stems; do not pull them off, especially those of stem-bases or root-crown. Do not try to make pretty specimens.

— A collector will want to know the names of his collections. Do not approach a key unscientifically. Work out the characters of the plant first. Do not be a robot.

— On the objects of collecting. cf. F. B. 59:43.

— Record the shape of heads in Compositae. In drying the shape of the heads or especially involucre is often markedly changed. Erigeron involucre of ironmaking in the books is described from dried spms.; in nature the involucres are cylindric.

— Invariably I write better diagnoses from field notes than from dried specimens.

– The union of the rifle scholar and hardy adventurer * * is not common. There is something particularly attractive in this mingling of wide, often recondite learning with the breath of mountain air and the scent of boreal heath, the sound of mountain springs and wide prospects over sea and land. – Richard Aldington, Atlantic Monthly, 163:759.

– Transparent mounts for field herbaria. E. W. Haasis, Madroño 5:121.

– One must look sharply when he collects or he will miss valuable things. But it is not enough to be keen eyed; the eye must be reinforced, backed up by the scientific imagination. In illustration of such an injunction memory comes to my aid with a most interesting incident. As

a mere lad [I was in the year 189] an assistant in the Department of Botany of the University of California. There was one professor in Botany, Edward Lee Greene. The Department occupied one room in the north end of old South Hall, a solid building on the campus. One day entered two visitors to call upon Professor Greene. They were somewhat unsailish men with the quiet eyes and serene look of men who spend much time happily in the open. One of them was W. L. Wright of San Bernardino, the other was, I think Edward Palmer. They had been on a botanical trip into the North Coast Ranges through the Redwood belt, and had brought back many plants. One

"Of these plants was a strange beast"; a strange saprophyte, whitish and subglobose, covered with many dull-colored scales which could not wholly conceal the curious flowers crowded at the summit. After the gentle old men were gone, Professor Greene brought this remarkable plant out into the main laboratory and showed it to us, holding it forth in his hand: "See there", he exclaimed, "these collectors got this although still underground! They sensed it was there in the forest floor because they saw the leaf-mold or forest humus upheaved and broken slightly by the growing plant. That is the way to collect!" The plant was published by Professor Greene as Hemitomes pumilum. It is now referred to

Newberrya congesta Torr.

— Botanical material for the establishment or retention of a species should be adequate. It should be sufficient to establish fully, to confirm completely the offered proposal. Any other practice is defective; it is indeed unscientific. Species are published, retained, accepted by other authors on the slimmest foundation of material — material so incomplete that it is impossible to defend the proposed species. No species should be accepted in a standard work unless it can be fully and scientifically proven. The case of Gilia traskiae is before us. In habit, aspect, stems, leafage, pubescence, it is exactly like material of

Collomia heterophylla. Dr. Hoover tells me there is no flower on the type material (Cal. Acad. Sci.). There is only one other collection known, I think, T. S. Brandegee (U.C. Herb.). It is young. Contains no flowers in situ, only one young calyces in a pocket, a fragment of another, another glued to sheet which is very mature and so ruptured as not to show sinuses. The corolla in pocket is quite different from Collomia heterophylla, but may it not be young? In spite of all this double botanists have included it in floras, I in my Manual, Munz, and Millspaugh.

– Collecting, Pressing, Drying and Digging Specimens. L. Benson. Torr. Bot. Club. 66:73-84. 1939.

– W. C. Cusick distributed in 1908 some admirable sets of plants from a then little-known region under the printed label "The Mountain Plants of Eastern Oregon", but he gave no stations, not even a county. It is a great pity. The addition of a locality would, for serious students, have added weightily to the value of the collections, for there are few things more informative than the environment of the plant. It is the true basis on which effective knowledge must rest.

– Geology Field Trips. Science, Nov. 10, 1939, p. 441.

(Separate File – Local Ecology.)

— Boraginaceae. Piper says: It is very desirable that collectors endeavor to secure both flowering and fruiting specimens of each species. The great bulk of the material in herbaria is either in flower or in fruit, so that it is very difficult to determine which flower goes with which. Related flowers in fruiting material are unsatisfactory, as they are frequently much smaller than is typical and therefore apt to be misleading. — C. V. Piper, Bull. Torr. Club 29:536. 1902.

Locality: Obscure Indication

— Munz, P. A., says on label of Amsinckia tessellata: "20 mi. of Box S Ranch". That might be near Stoddard Well; near Ord Mt.; in a north arm of Lucerne Valley.

(Lawrence) Taylor * collected Linanthus aureus and labled it "40 miles east of Bakersfield". Now "north" or "east" may well mean northerly or easterly, seldom the exact compass point, so that a considerable range of what was the locality would be possible. In exact both these cases it would have been possible to give an exact locality. The region forty miles east of Bakersfield is in the Sierra Nevada where there are numerous place names for hills, streams, meadows, valleys, canyons. In this particular case an exact locality was important because that species had never been collected but once before in the southern Sierra Nevada. Twenty miles north of

* cf. p. 86.

Box S Ranch these are wrongly local names of springs, hills, valleys to give a more satisfactory indication of locality. Bad examples of this kind are often imitated and may become a fad, so that we would have a localities in California standardized on San Francisco, say: 580 miles SE. of San Francisco; 165 miles East of San Francisco; 240 miles north of San Francisco, 15 miles south of San Francisco. Practices of a sort often tend toward absurdity. (Cont. p. 72)

— In selecting individuals of Brayia nacrae in the field take a spm. with flowers and fruits if available which is usually the case; then snip of fruiting

branchlets from a plant that is so dead ripe it is ragged in appearance and throw such branchlets into the folder. This is, of course, a good rule with the plants of most families. Commonly one finds a colony of plants of different maturities and selection should be exercised, the judgment used instead of putting in press the first thing that comes to hand.

— The young collector, and also many an older collector, goes into the field and is attracted by the showy vegetation, by large plants or by plants in conspicuous flower. Certain elements may be overlooked. An element which looks as if were simply a near-by species in young flower or poorly developed flowers may in reality be a species

which is quite distinct and has a number of truly good characters to distinguish it when fully examined, but has taken on a sort of simulation so that it is enabled to masquerade as something else to the merely casual observer. The sharp keen observer, the eagle-eyed field botanist penetrates such a weak disguise and pulls the plant into the open. For example: Amsinckia glomerata passed for long as merely a very rough form of A. intermedia; A. hellerii as a small-flowered form.

– Cont. from p. 70. I chanced across, in (Borraginaceae herb.), one label: "40 miles north of Alton", Humboldt Co. I find "32 miles east of Paso Robles, Muns 10,148", Amsinckia spectabilis Suksd., Werdenda, 103

– The name of a county should be added to the place name of the station; such is a good rule. But do not be a slave to a rule. Use common sense. "Shay's Mill, San Bernardino Co." might be easternmost far from the coast line; it might be transmontane and near the Colorado River; it might be intramontane high in the San Bernardino Mts. It is much better to say, if transmontane, "Shay's Mill, Mohave Desert, both ecologically and geographically. "Deer Creek, Tehama Co." might be either in the Sierra Nevada or Coast Ranges, or Sacramento Valley. It is better to say Carpenter's Mill, Santa Cruz Mts. than Carpenters Mill, Santa Clara Co., which latter would permit it's being in the Mount Hamilton Range. The name of a valley,

added to the station, is often of more value than the name of the county which may be largely meaningless.

— I wrote one of my correspondents, Mrs. C. H. Smith, Woody, Kern Co., of the advantages of numbering specimens that she collected. She did so — but curiously she reserved a given number, say 38, for a given species, say Linanthus ciliatus each time that she collected Linanthus ciliatus. The advantage of numbering specimens in sequence as collected is so great that I never fail to do it. The advantages are enormous. And yet when this correspondent introduced fallaciously a confusing practice I found it not so easy to explain to her why her method defeated the

objective to be had by numbering the specimens. To use the same number for different collections is confusing. If the collector is sure that each time Linanthus ciliatus is collected it is Linanthus ciliatus then nothing is gained by adding a number. Let us suppose that Linanthus ciliatus or what is supposed to be such is collected six times and each time, at different stations, the number 38 is given to the collection. On studying these collections I find that two of the collections represent the variety decorus, and so I write you four 38s are Linanthus ciliatus and two 38s are var. decorus. All this confusion is avoided if given a separate number. One of our very variable species is

Godetia quadrivulnera. Of it a considerable number of specimens or collections were made in Vaca Valley in 1884 to 1890. One of these was described as a new variety. (They were not numbered.) Later on, many years later, it was difficult to tell which specimen had been used for the type of the species. If the specimens had all been given one number it would have added nothing (when collected) to the certainty as to the type. If the specimens had been given serial numbers and the type number recorded all doubt would be expelled.

I must admit that the fallacy in Mrs. S's practice is not easy to expose in a few words. But even where named species or varieties are not involved, one may wish

to distinguish between collections ecologically. So it is futile to say of Hemophila parviflora, no. 38, a shade form; no. 38 a dry land form. All this seems like laboring the obvious, but collectors who are otherwise highly intelligent will use as many use numbers to carry out a system of classification of their own. Or they will, agonizingly enough, repeat the numbers of the 1885 distribution of their collection in the next years distribution of plants. All such eccentric or thoughtless practices, wholly unnecessary and always disadvantageous, should be avoided. To give a particular number to one species always in the field involves too great an assumption. A particular collection may not prove to

by that species, whereas the number given a particular collection should be fixed, permanent, unchangeable.

— Scraps of material: One of my most interesting correspondents was a Mrs. Edith Rockwell. I never met her, but I am sure she had brains. This inference seemed inescapable. She sent in for naming the most extraordinarily interesting things but always in the form of indeterminable scraps. They could have been determined 100 years ago today with our more highly developed knowledge and scrutinizing care. Undoubtedly some may have seemed interesting because scrappy and not representative.

— Numbering specimens in the field: cf. F. B. 46:166.

— Numbering specimens. The object of numbering is to be able to identify a particular specimen, not a particular species. If a collector gives the same number to a given species each time he collects it then one cites as follows: Ranunculus californicus, Smisun, Jones 22; Benicia, Jones 22; Martinez, Jones 22. In other words the use of the number here adds nothing. It is superfluous. The identification here depends wholly on the specific name. One can cleave off the 22 and lose nothing. But yet again species identification in the field is very uncertain, so that Jones 22 Smisun might be Ranunculus californicus; Jones 22 Calistoga might be Ranunculus occidentalis. On the other hand collecting serially numbered

in sequence furnish truly scientific material. The State of California Geological Survey collection in botany was serially numbered. I worked upon the set reserved for the University. I got my start in Botany because the specimens were numbered. Why? Because Asa Gray and Sereno Watson in writing up their plants used the Brewer and the Bolander numbers in their publications and I was able thus to know definitely what they meant by a given species.

Taking notes; the habit of writing. – The young botanist should make record of his observations and not depend upon memory because the memory is exceedingly treacherous. There are two kinds of ob-

servations, to begin with, that may be recorded: first, facts of all kinds, and especially obvious facts. In writing up a systematic account of a group of plants one needs to know the size of the species. Few things are more lacking in records than figures as to size. Size is not of first importance, to be sure, but it is needed to complete a description. Every species has its own distinctive size limits, and records should be made in the field because, even of small plants, herbarium specimens do not always give a fair or just idea of size. One finds a shrub species in the field; there it stands before you; one sees it and what it is and how large or small it is; and it is very difficult to feel at the moment the need for making

any record. One can never forget that shrub and what it is. But one does forget. The putting down of facts on the spot must be cultivated; it must become a habit. Second, put down ideas at once, get them down, make a note, the moment they occur. Ideas are extremely elusive, especially the germs of important ideas which can only be developed by continued thought and pondering. By recording suggestions of ideas, the mind is stirred; and more and more ideas will result. By cultivating actively the mind original thought is freely generated — and sometimes ideas come so fast it is difficult to get them on paper before it is too late to seize them. The

habit of writing helps towards highly desired ends. Writing clarifies thinking. When one tries to express a certain thought on paper, one feels the need of rising to a level he had not felt the need of before; a vague as uncertain idea under the force of such an impulse becomes a clear and telling statement of something that needs saying.

— Keightley, T. Notes on the Bucolics and Georgics of Virgil; with Excursus, Terms of Husbandry, and a Flora Virgiliana. London. 1846.

— Numbering of Specimens.

There is need to have each specimen or collection given a number, preferably in sequence serially; there is always need to have a way by which a particular collection can be identified individually.

The citation of locality by collector, station and date does not meet the requirement because a collector may make many collections with exactly the same data. at a given station

The indication of the species is insufficient because the species is so frequently in doubt. In order to illustrate an example the species it is just this precise distinguishing number for a specimen that is needed. Ordinarily we are concerned with making a determination of a species, - that is the problem for decision - and we need specific data already established on which to base our record of the determination. Moreover, even if the specific name of several collections of one species at a given station were certain,

even so, we may wish to distinguish amongst them. One or more of the collections may represent distinct varietal strains which have not yet been worked out, or different ecological types which may wish to cite precisely. I collected long ago in Vaca Valley specimens of Godetia quadrivulnera - several different collections. One of them was variously named as new. Later I had difficulty locating the specimen used as the basis for the type because no numbers had been given the specimens - all were from Vaca Valley at an early date.

- Collectors sometimes pass by colonies or individuals, thinking they are merely depauperate phases, or underdeveloped states, or diseased

states, when in reality they may be normal states of plants that are characteristically dwarfs, plants that are normally with small or irregular inflorescences, or with peculiarities that are really specific and not pathogenic.

— Cont. from p. 69. He also writes of Linanthus demissus," 20 mi. s. of Dante's view."

— It is often difficult or troublesome to make specimens. Dr. K.M. Wiegand told of making specimens in an especially rich collecting ground on his transcontinental trip in 192 . It was a swamp. And the attacks of mosquitoes were maddening — but he went ahead with his job just the same. But

two students with him, young men, couldn't stand it. They could not "take it". They deserted job!

— "Der Wissenschaft ist ein Kampfplatz". — Presl, C. B., cf. F. B. 44 : 48.

— Numbering collections: What one wishes to do by numbering specimens is to identify a particular specimen with a particular locality. If the same number is used over again for other specimens of the same species at other localities one cannot do this. The number has no identifying value.

— It is seldom useful to make records of critical species in the field. I recorded Gilia aggregata for Kern Peak (F. B. 25: 104), but now I cannot use the record. I am uncertain but that it might be

var. bridgesii — a variety having on the whole too fine points for field determination.

— Gathering minute plants in the field. cf. R. B. 39:187.

— Plants without field data not used: cf. letter to Mary Beal, Apr. 2, 1940.

— The field press should be simple, strong. I use a 16 x 11 because in the old days everything was carried in one's hand or on his back. You still must go a-foot if a real botanist. No real field botanist should become soft and travel only in an auto. Systematic botany is not for weaklings. Be ready for rough country and endure hardships as if they were nothing. Be ashamed to collect only along an auto road. Remember the injunction

of Old Baloo in the jungle: "Give them silence when they say, Come with us an easy way." Science is the finest and most inspiring thing in the modern world. Cultivate the high grandeur of aim of the Roman scholar in the second century, B. C., and the learning and idealism of the Greeks. There has never been in the field of letters anything finer. Any savage can listen to the radio, any fool can drive an auto and ride in an electric car but only a youth with brains and a lofty sense of the high ends of civilization can join the age-long company of scholars, and only a scholar can become a systematic botanist of the real sort.

I sleep in the open under the stars, because under the stars is

always bitter. I carry a little 5 x 7 A tent for the purpose of changing driers. Many a time I have stopped in a meadow or flat or by the wagon trail and rigged up a brief shelter against the wind — running the ridge rope out a long distance and staking it down, tying the other end to a tree or cliff rock or the wagon seat, or elevating the tent end by a pole — any makeshift way to get shelter for changing driers in protection against the wind.

There is always wind. Even in the stillest hottest days in the Great Valley, cyclonic air currents will suddenly snatch a folder and land it ten or fifteen feet away.

Usually I carry three presses — a collecting press and two drying presses. In the camps the four sides of the two field presses enable one to have four packs of plants running under weights. If there are no weights in the way of stones or otherwise available, to be had, then I fall back on the two presses with their leather straps.

What I set down is my own practice. Such is not necessarily the best practice for every one. The best practice for a collector is that which he evolves or adapts to his own needs and temperament and which most fully achieves the end sought — namely well-prepared specimens accompanied by full and

lucid and inspiring notes.

Young botanists should strive for perfect physical development. Cultivate resilience of the body. It is of great importance for a life in the wilderness.

I mark in the field each locality and number. If the number is lost or injured by tearing of the folder, the specimen may be traced back by the locality to its number; its means of identity may be traced.

— Field clothing an important part of equipment. Especially shoes. For the desert a composition sole is good, if thick, since so much rock work. Scarcely ever does one step on a stone in the desert but that it turns under foot. Upon the Coast Range foothills in summer, slick as glass with dry grass, one needs hard nails in his shoes.

— In the Panamints, April, 1940, I had as a companion in the field a young fellow, Edgar Shantean, furnished by the National Park Service. He was keen about seeing plants and brought specimens into camp. Almost invariably an individual plant was brought in in fragments. A plant makes a more instructive and attractive specimen if whole, complete, and not broken carelessly into separate fragments. Shantean took no care with specimens — no delicacy of handling. Neither did M. French Gilman. If he brought me the whole plant, even if in 2 or 3 or 4 separate parts, it was sufficient. (cf. U. C. P. 13. 59: 154.)

– fruits. It is always important to collect them. All the more in that they are often neglected. Collectors tend to notice and take specimens of plants in anthesis, and ignore or disregard the plant in (because conspicuous more or less) fruit. In many families, the fruit is essential to an (knowledge of) understanding of relationships. "By their fruits ye shall know them". In some families the fruits are not differentiated – differentiations affecting other organs; but even where the fruit is uniform, collection of fruiting stage is important since the fruiting stage is part of the life history. The fruit is very uniformly capsular in Polemoniaceae, but in some species the capsule or embryo is markedly

zygelas – departs conspicuously from the usual or prevailing or typical family pattern. One can never anticipate when in a given group investigation of the fruit or the seed may become important. Therefore the collection of fruits should never be overlooked. In my Manual, 371, it is noted that specimens of Ceratophyllum demersum are "seldom collected in fruit." W. C. Muenscher writes: "The writer's field experience leads him to believe that Ceratophyllum flowers and fruits are much more common in nature than their scarcity in herbaria would indicate." – Am. J. Bot. 27: 232.

– In bending long stems to adjust to folder in field press it is sometimes necessary or desirable to mac-

erate the stem at the bending point to prevent complete breakage as in the case of brittle stems. M. French Gilman noticed my doing this and commented on it. He (in the Panamints in April, 1940,) had never practiced the device nor thought of it. He takes no pains with specimens in collecting. He has no digging tool and so in getting a plant out he often loses the root or most of it. Such ways also result in breaking the plant into 2 or several fragments. I imagine he took no thought of this – regarding as only necessary to get the whole plant. He kindly brought me many plants. For his own press he seemed content with smaller

fragments. – May 24, 1940

– Scrappy material should be considered as inadmissible evidence, as irrelevant and immaterial. Any serious work should rest on the best and amplest material. L. H. Bailey said of the Rubus material in U. S. herbaria: It is unworthy the serious attention of any real student of the group.

– It is nearly always important to avoid roads and cut across (for collecting country.)

– Some one tells me that F. W. Peirson, who fails intentionally to number many of his collections, gives numbers to specimens of other collectors coming into his herbarium. In reality his numbers are herbarium numbers and not field numbers at all.

Suggested Titles

A Botanical Guide for making
Field Records and Collections
of Plants in California
for the use of
Lads in Berkeley who begin Caesar
at Thirteen.

—.. —

A Guide to the Making
of
Field Records and Collections of Plants
in
California
for the use of
Lads in Berkeley Who Began Latin
at Thirteen.

—.. —

Vade Foris

- Scrappy Material. cf. "Botanists of Cal. and w. Am", vol. 1, p. 55.
- Miss Mary Beal who collects for me in the Mohave Desert had never had a chance to gather Asclepias subulata, a strange reed-like milkweed of the desert, but the stage on which she was riding stopped in the desert between Amboy and Danby to change a tire and she was enabled to get it at that spot. cf. Mary Beal in litt. 7-11-'39.

- It is difficult to believe that there is any feature of the plant which is not important as to determination of relationships in some way at some time or in some group.

see next p.

- Frank Bancroft (of the famous Bancroft Family of California) once collected native plants when quite a young man. Seeing me spread out the leaves in arranging a specimen for pressing in the folder, he said: "I don't bother about that. All I care about is the scientific use of the specimen", meaning that good-looking specimens were merely fastidious, quite unnecessary for serious work. This is not true. A specimen should look as natural as possible - represent the living plant, hold the mirror up to the living plant as nearly as may be. Leaves are sometimes of real generical value. Two forms may be alike as shown by their leaves - but if the leaves are

crowded into an indistinguishable mass in two collections this point may be wholly obscured. Or two forms may be unlike and the unlikeness must discernible in line or pattern of leaf. Sometimes leaf shape, leaf cut recalls relationships that are would otherwise miss, — hints of ancient connections in ancestry may well be revealed in the leaf as well as in any other organ. Indeed there is no organ of the plant which may not be of genetical value. (at some time or in some group)

— Dr. H. W. Pennell of Philadelphia Academy, who is there in Berkeley now, says in his field work with Scrophulariaceae he records the color and color pattern of the flower in each species studied in the field, using the Ridgway Color Chart. He regards this record as of great value.

definite Localities

The citing of a definite locality is often made a very difficult thing by the collector and, one would think needlessly. Collectors have a trick of using a boundary line as indicating the origin of a collection. But a line has length and may be, usually is very indefinite. There lies before my eye a plant labeled "Lake — Colusa County line on road to Williams." Now Williams is very far away from the Lake County — Colusa County line and this collection might have been made at a number of different points

on that line or a number of roads which cross the line on their way to Williams.

The Untrained Collector

The ordinary person is unable to take enough material of a plant to furnish a basis for identification. It is odd. He brings in a single leaf and asks its name. Even botanists, not wishing to be thought ignorant, have developed too much egotism in naming or trying to name such scraps. The vanity of botanists is stirred.

The first requisite for a collector is the possession of such an intelligence as will enable him to exercise the power to take ample material. Material at one stage is not enough to be sure to show life history,

but ample material may show, felicitously, something of more than one stage, whereas scanty scraps would not. A plant in flower may occasionally bear a precocious capsule. At a pinch this may be enough for the moment. But all the stages possible should be looked for and gathered into one's folders.

Sectioning Plants

Some plants cannot well be folded into a V or N or M, — they are too bulky. In some cases I trim off one side of the plant; in other cases it is more satisfactory to divide the plant from top to bottom into 2, 3, 4 or 5 sections say, putting the first section into a folder and labeling it "a" with its field number, the next section goes into another folder and is labled "b" with its

number and so on. Tall plants that carry a good many branches lend themselves to this treatment.

– Difference between German and American botanists as to collecting. cf. F. B. 28:23.

– Beginners often make it a point to collect the plants in fullest flower. There is a point in collecting individuals which are partly in flower and partly in fruit. Often flowering specimens can be selected which show ripe capsules or ripe achenes or berries as well as flowers. It is an advantage for specimens to display both flowers and fruits, since these organs can then infallibly be correlated.

– Activities when taking a specimen (cf. F. B. 59:43)

– On sheets of Alsvearya in Bb. U. C., C. V. Piper has written on the sheet near a label, "O. K. C.V.P." Sometimes another botanist has later added a second determination. The notation of Piper then becomes useless or uncertain. The use of the vulgar "O K" indicates a bit of slovenliness. Why not write "Det. correct"? Better still, write your own det. with initials and then there can never be any doubt.

– Annual or perennial duration; always determine whether a plant is annual or perennial. This fact can usually be determined in the field. cf. also F. B. 54:126. Perennial herbs will usually show at root-crown vestiges of last year's growth, scars, scales or dead bases of branches or shoots.

— Precise statements regarding collection should be made.

Pectocarya setosa Gray.

Common on Mohave desert.

Coll. S. B. & W. S. Parish. June, 1886.

The label heading is: Plants of Southern California. Strictly speaking no locality is given for the collection save Southern California. "Common on the Mojave desert" is a statement of fact and may be accepted as correct, but the collection was not necessarily made there. It should have read: Mojave Desert; common.

— Rarity in individuals. cf. F. B. 50:71, at bottom of page.

— Always number ♂ and ♀ specimens separately. Since they are derived from different plants.

— Today Dr. Conklin [Lincoln] asked if J. G. Lemmon kept any field books, or if I knew of the existence of any such book? I replied: A determined search was made for a field book at the time that I went through the literary and manuscript reliquiae at Lemmon's house in order to secure material for a biography for the Dictionary of National Biography. The field book was especially needed to trace his travels. I found nothing that could properly be called a field book. Lemmon made numerous notes, jotted down an infinite number of things — but on scraps of paper or on a small sheaf of papers loosely held together, or scattered notes in small memorandum or irregular books —

a large lot of such material but without order, arrangement and almost always without dates.

Nothing of this could be construed as a field book.

Constance asked about numbers — that is numbering of specimens. I replied: He did not number his save those sets he offered for sale, made up for sale. He may have, irregularly, numbered specimens sent to Asa Gray, as a convenience in receiving determinations. Lemmon, in my opinion, was incapable of keeping a field book in an orderly and systematic and continuous manner; he had no power to make a real field book. He accumulated — but he never ordered up accumulations to any degree — mostly not at all. To make a

satisfactory field book, it must be done in an orderly way. One must number his specimens serially. Numbers are a check on specimens, on itinerary, on the calendar. A field book without numbers would not mean much — so much would be lacking in all the uses of precision and identification. Numbers give a sense of continuity and that is important — because there may be no continuity in subject matter — but a constant change of subject — varying with topography or flora on a journey.

As regular to the book itself, a fixed type is desirable. It is almost a necessity. I do not know of any one who neglected this matter of the note book itself who kept full, complete and unbroken records. A standard

notebook — that is standard for one's own series of note-books gives a sense of continuity. It tends to keep one going in a given direction of note-taking. One may put down or put down little at a given time or in a given year; one may have the widest latitude as to what is put down and the manner of its recording — but the book itself should be a symbol of your duty to keep faith with the duty of field records — to record, to add something, if only a little, to the total of what has gone before. The objectives of the records on the pages may be extremely varied; but the actual book, of a standard size and binding, should become a sign of an orderly procedure.

Such a series of field books filed more readily, more compactly; they are used more readily and are in every way more satisfying as a standard series. — Dec. 6, 1940.

— The searcher after new species in the field makes records, at least of specimens as to date and place. Usually he does not do much else, even of obvious facts. W. H. Camp (N. Y. Bot. Garden) in the Taxonomic Index (say about June, 1940; rather recently anyway) asks collectors to note and record the height of the plant. On the other hand, the intensive careful observer commonly records a good deal about the plant, features of its life-history, its relation to other species, and so on. He sees a great deal and writes it all down. But this type of man commonly makes no

validating specimen — and in the course of the years it fall out that we are uncertain as to which one of a series of critical species his observations apply. What is needed is a man who combines these two points of view. Such a combination would strongly further the progress of local systematic botany.

— Winter botanizing. cf. "Berkeley College", notebook, p. 168.

— Collecting within a town limits F. B. 59:58.

— In China. F. B. 41:165.

— E. L. Greene. When we were lads in his laboratory he had some expressive and contemptuous remark for a young collector who broke off sappy parts or fragments from the tops

of plants.

— Pressing and drying plants. Lyman Benson. Torreya, 39:73.

— Plant Collection. cf. B. D. Jackson Guide to the literature of Botany, p. 917.

— Life History notes. cf. F. B. 26:82.

— Suggestions for collectors. J. M. Fogg, Jr. Rhod. 42:145.

— Taxonomic Index, vol. 3, no. 5.

— An experienced collector when in the field may pass a starved or desperate-looking plant, growing in a rocky or sterile spot with the idea (situation) that it is just an indifferent individual when its stature may represent a normal condition. Thus it may be a species quite different from the common species it was thought to be. cf. Cryptanthaz in the chaparral.

Interest Attaching to Scraps

Scraps of plants, fragments of parts, pieces broken off the tops of plants, tiny bits separated from the organs to which they belong — all sorts of incomplete or served portions often, very curiously, have a fictitious interest. That is to say they have or seem to have an interest out of all proportion to their genuine value. And that is because a small part is dissociated from the whole. If the whole were before one it would be seen in its true proportions. And yet people love to bring in to one these slight fragments. A portion of a leaf may be a very puzzling thing.

Recollecting.

E. L. Greene said when expropriating material of collectors — taking all and leaving them none — "Ah, well; they can get more"! Now as a matter of fact one cannot, in practice, collect the same things again in the case of a considerable collection; or it may take many years and an excessive amount of work in view of the relatively small returns. In 1927 I lost a bundle of plants — one bundle out of a large collection — on the South Fork San Joaquin — in the high mountains. A list was in my field book. Several years later I tried to recollect them at the same time of year. I failed as to most of them. — So it is important, when unusual opportunity arises for collecting certain species, to

collect fully. And never defer collecting with the idea that better material will be found further along.

— Lindley, John. Introd. to Botany. 1832. chap. 6. Of herbaria.

— Places to collect in Cal. F.B: 61: 6-8.

— On the delights of field work:— Carolyn Hersh, in litt. June 5, 1941.

— Rattlesnake bite. Carry remedy and wear boots in desert. As to attitude towards snakes and effect on snakes, see F. B. 60: 494, 479.

— Closely allied plants — it is important to distinguish them in the field by habit — because habit is of importance.

— Boraxo, — a fine soap for the field.

— cf. note on M. French Gilman, F.B. 60: 269.

— Foliage of growing shoots. Importance of collecting. cf. as to this Physocarpus capitatus. See E. L. Greene in Pitt. 2: 27.

— Common plants are often disregarded as having no interest. One of my former students, Florence Mayhew Shinn, speaks a word of appreciation for one of my laboratory courses which helped to give "a better understanding of the beauty and order of the world. Meeting and talking with you on a Berkeley hillside with a branch of fresh budding Buckeye in your hand, did even more perhaps." — Florence Mayhew Shinn, June 11, 1941. In Jepson Correspondence.

— Botanizing freshwater marshes in Cal.: poor in species at low altitudes. cf. F. B. 39: 3.

Letter to Miss V. F. Hesse: 7/31/41.
"Numerals for collections are cheap. Try to avoid using the suffixial "a", "b" et cetera to numerals as much as possible. Always use a new numeral for a new collection. Disregard species in the use of numerals."

It is surprising how many persons otherwise intelligent use numerals by way of classification and not for collection. By giving the same number to the same species each time they collect it, the groundwork is laid for trouble. Actually the door is closed on all further research, all further investigation of those plants of the various collections bearing the one number. Or if they are investigated it may be

found that collections appearing to be one species are really two or more species. If so there one is in trouble. You cannot cite the same number for two or more different species. The numbers can not be conveniently changed, or if changed there is difficulty. Those numbers have been cited in cross-references or in various places which are not easy to find. Material may have been distributed to various herbaria and it can not be gotten at to change the numbers. Moreover changing the numbers is in itself a bothersome nuisance on a lot of specimens. Why bother with all this! Use a number for one collection only — and it is fixed for-

ever. The determination of the species which the specimen represents may change many times – but the number always remains constant. It is a fixed point which is highly useful for indicating with certainty the equivalence of all the various binomials applied to it by various botanists or by one botanist at various times.

– Habit of plant must be described in the field; note carefully the form; this is important, because allied species commonly differ in a significant way.

– Stillingfleet B., Carl von Linné. An oration by Linné concerning traveling in one's own country.

Library call mark: QH 9. S8. 1762.

– Plant Hunting in the Wilds. By Francis Kingdon Ward. QK 341. W3

– Some student asked A. C. Lawson how to know Andesite (it may not have been Andesite, but some other mineral). Lawson replied: "By looking at it five hundred times". (!!). This story has application in Botany. You learn a Coast Live Oak in the field by looking at it many hundred times and thus you are able to distinguish an Interior Live Oak by looking at it also many hundred times. To the ordinary traveler an extent of chaparral looks alike. But if you look at it again and again, that if you look scrutinizingly over and over and never weary, yet again and again; it begins to resolve itself into its components. The eye is trained to see, the mind prepared to study.

– Plants should be recorded as of their characteristic or dominant situations. Trichostema lanceolatum, dry hills or flats. T. laxum, river "bottoms" and seasonal stream beds. As a matter of fact T. lanceolatum might occasionally and exceptionally be found in stream beds. But such exceptional or unusual records should be set down as such, as exceptional.

– When one goes into a region new to him he finds many plants unexpectedly. It is one of the elements of interest in a new region – one runs across so many plants new to the distribution. By chance, as it were, depending on the season and the year, one finds many fine things. But certain

plants are apparently not found by chance or rarely. One must go search for them.

– Conservation areas:

cf. Fernald, M. L., The Problem of Conserving rare native plants. (Smithsonian Rep., 1939). See separate.

– It is so extremely difficult to get persons to record a few simple facts when collecting a plant: the locality, county, date, collector. From Kern County splendid specimens have been coming from Mrs. C. H. Smith. The localities have as a matter of course been written as in Kern County on the labels. But I now discover a few are Tulare Co. Since the names are highly localized ones, how is one to tell?

Put down first locality, county, date, collector – then after that

as much as you like. In the case of Mrs. C. N. Smith, however, her data is very detailed as to the specific locality.

— Do not specify a plant collected by "road" which has any length. cf. "Tioga road" (Bull Torr. Club 28:150) or "Hog ranch road" (l.c. 28:148).

- Where critical points are involved, a series of specimens of a given plant or a given collection number should be ample and sufficient to be of decisive value to an investigator. It is also desirable that representation of a given species cover as much of the life-history as possible. — From

my letter to a correspondent at Modesto, 2-1-42

- A young collector will wish to determine his plants - the plants which he has collected. First let him study his plant and and dissect it. Then write out a description of the essential points; do this always before using a manual or flora. cf. N.E. Brown, the great monographer at Kew of Ficoideae and succulent Euphorbiaceae. F.B. 55: 70.

The other way, the easy way is the way of the class mob. Avoid it. Take the hard way for the sake of purity and satisfaction and intellectual. It is the hard way of the Ten Thousand in the hinterland of Asia Minor

reaching an elevation in the the terrain and crying: The Sea, The Sea. It is about Balboa, to a peak in Darien fighting his way and

It is the soul of Samuel Johnson, burdened with racking poverty, befriended by no man, but laboring with undying zeal to finish his great dictionary, and incidentally to write a letter to Philip Dormer Stanhope, a letter proclaiming the independence of the scholar for all time, a letter to be framed in letters of gold for the study of every scholar who value his status as a man of letters.

- First Botanist to number specs. Natives of S. Africa. cf. F.B. 51: 9.

— Avoid short-cuts, easy ways. In your field book: you may collect Ranunculus californicus, on account of its diversity of form or aspect, a half-dozen times. You may similarly collect Cryptantha torreyi, a dozen times. Becomes so difficult to critically appraise in the field. Write the names out in full, after each field number. Do not write "the same", the way many professional botanists do. Because the determination of one of these numbers may be changed when studied critically and the change would invalidate or upset all the notations following.

– James Petiver. Collector in South Africa at an early date. Said to be the first collector who numbered plants. cf. notes in E. B. at Kew, in 1930. Any record in various bibliographies? or library card catalog?

– Solarium xanti Gray. "Roadside near Wheeler's Hot Spgs.", Pfanz 13,160. But the plant was there before the road was cut through. There are few cases where a native plant can be said to be a roadside plant, which is a native plant.

– Trails in the hills. cf. Berkeley College Notebook, vol. 1, p. 179.

– Pressing specimens. cf. Berkeley College Notebook, vol. 1, p. 124. cf. index.

– The "look" of a species. It is

well for the collector in the field to learn the aspect of a species. In the field each species, without investigating its critical characters, displays a peculiarity of habit; branching, posture, hue, aspect which is of itself and distinguishes it from other allied species. There are mainly things not expressable in words or not easily or only perhaps vaguely. And yet if taught to regard plants in the field with a critical eye one can differentiate say even Cryptantha species which depend upon technical characters of the fruits for elaboration in systematic texts. cf. Systematic Botany notebook, p. 198, bottom of page.

- cf. letter to Campbell Gordon, May 13, 1942.
- cf. letter to Mrs. A. F. Van Deventer, May 11, 1942. "It is a way of excellent intimacy with plants."
- The utmost pains must be taken to attach accurate data to specimens. Failure to do so may make much trouble and result in false scientific records. Unending trouble may result from mixing collections or interchanging records. cf. Notes on the Botanists of Cal. of W. Am. 1:216.
- As to herbarium work: you must derive your foundations from work in the field. cf. letter to J. B. Tracy, June 1, 1942.

- These notes are not addressed to professional collectors. "They know their business best". They are for those who mean to study plants critically and for whom it is important to get their foundations from experience in the field.

Always I taught students to accumulate a body of facts, real facts, known facts, in order to be able to discuss theories, test theories. Established facts are permanent assets; they represent permanent knowledge. Theories come and go; theories get out of date and are relegated to the dust heap; but facts live on forever. All this I preached fifty years ago. Today I noticed in Sci. 94:312, a saying about the chemist, Edgar Fahs Smith: "He championed the impor-

tance of accurate finding and recording of facts, and he encouraged the use of theories only as they helped to clarify and classify the facts."

- Photographing plant subjects.

1. Make a list of the associated species.
2. Conditions of the site.
3. Collect validating specimens.
4. If a human figure is in the picture, do not make the portrait of the plant in such a way that it is also a portrait of the individual. Place the individual to one side of picture or in background, never looking at camera; better looking to the rear often; often advantageously seated.

- In your field book keep a running record of the day's travel and route, of the night camps. Some notes on the climate will also be useful, or at any event of the weather. It is especially important to note the weather, at least, if climatic data be not feasible. Topography is very important, the character of the country, slope and soil, the lay of the ridges or ranges, the cañons or valleys and the plains. Also various events of travel, climbing, field work may be set down; as well, of course, as everything relating to the vegetative cover.

One of my students, Dr. R. F. Hoover, went on an expedition into the Sweetwater Range in northeastern Mono County, a desert region, east of the Sierra Nevada, – a desert range that no one ever before, so far as

I know, ever visited as a botanist. He collected fine material; he was deeply interested in species; he had a good eye for new things. But he came out of that remarkable without one word written in his field book* about the country and its vegetative aspects; not a word about travel or travel routes or possible ways of crossing the ranges. Nothing. Such a lack minimizes the interest of such a trip tremendously. — July 29, 1942 — C. F. Baker, his failure to cite specific localities in his lists of plant collections (West American Plants. Well printed and well gotten up). See Botanists of Cal. and w. Am. note book, vol. 2, p. 229.

— Burt, E. A., (F. B. 44:162).

* nor did he speak a word about the expedition.

— C. G. Pringle to young collectors: see Life and Work of Cyrus Guernsey Pringle, p. 16, by Helen Burns Davis.

— Asa Gray did not know the W. Flora by botanizing says M. L. Fernald. cf. F. B. 50:159.

— The preserved specimen as a fixed point. F. B. 54:34.

— Camping early. F. B. 52:93, 110, 199.

— Write out fully and clearly the description of a species before starting to determine it. N. L. Brown did this: cf. F. B. 55:70.

— The labels of David Douglas. F. B. 51:122.

— In the spring of 1910 there was brought to my laboratory, left among laboratory in Botany Building, a fine cluster of Cypripedium stems in flower. I had never before

seen the living flowers and immediately detailed notes on the flowers were made. The flowers came from somewhere in the Bay region, but just where I could not find out or by whom. Lying in the orchidaceous corms to this day, the sheet of them is an anomaly: they are without record of a local habitation, although they have a name, Cypripedium californicum Gray. But how much it would add to their interest and value were the collector and station known. Orchids of the genus Orchis have a special attraction for the collector in California. For this reason they should not be collected or only very sparingly. On account of their few species and their rarity

It is desirable to practice the art of drawing – to learn to draw. Material values, capable of being preserved in no other way, are thus added to the field record. One can make drawings of details of the flower which clearly preserve features and structures that are lost or obscured in the dried specimen. Topography, too, may be advantageously sketched. A camera for landscape work is highly useful but all features are received without discrimination on the film of the apparatus – whereas with the pencil important features are emphasized, are selected, strengthened, brought into relief. In this respect, no old books relating to West American natural history are so interesting as the Pacific Railroad Reports.

They show so well in so many ways what can be done to portray the most interesting features of a country, its [physical nature human inhabitants, its animals, its trees and flowers.

— Observations on form, habit, size, duration of the plant in the field. There are few aspects of the plant in the wild which have less of specific description and factual matter on record than form, habit, duration, size and various developments or factors associated with these. Mode of branching, development of form, leaf persistence and so on.

Many collections of paintings of native flowering plants have been made by California artists. Some of these are of unusual excellence — faithfully and carefully done. No one of them that I know is, however, validated by a set of dried specimens. The material used in making the drawing has not been preserved. Such collections, the result of so much labor, so much skill, should be validated, should be backed up by a set of herbarium specimens.

Interesting and beautiful sets of photographs of native plants are numerous. To a botanist most of these are not useful because, without specimens, one cannot be sure of the actual species.

– "He championed the importance of accurate finding and recording of facts, and he encouraged the use of theories only as they helped to clarify and classify the facts. A favorite remark of his to the effect that theories come and theories go, but facts live on forever." Arthur A. Blanchard on Edgar Fahs Smith in Science 94: 311 (1941).

– Need for field work in order to differentiate and describe the species of Leanothus. – E. L. Greene in Pitt. 1: 246.

– On June 26, 1925, Frank W. Peirson, discovered in Convict Creek, Mono Co., a Pedicularis new to California, namely Pedicularis crenulata. His

collection number 6090. On July 25, 1927, he found it again near the first locality in Convict Creek and gave this second lot of specimens the number 6090. In other words the collector uses collection numbers to designate a species, at least from one locality. This is an unscientific procedure. It is in effect stating or trying to state that the determinations of these plants are fixed, that there must be no further research upon them. The use of the one number for both collections does not permit or at least provide for further study, any possible differentiation. It often happens that collections from one locality given one numbers are found on investigation to

consist of two distinct species. The designation of a species should be by its binomial, of a collection by its collection number, with which is associated locality and date. — Data in field work. E. D. Merrill Bull. Torr. Club. 61:71. Other articles following in same vol.

— The object of field work with plants is to study plants in the field, observe plants in the field, compare plants in the field, make record of plants in the field. The herbarium specimen must never be an end in itself but only a voucher, in so far as it can be, of the field records. Note well (Pitt. 1:241) what E. L. Greene says of a distinguished botanical explorer: "Thomas Nuttall, who knew more about his species than the herbarium specimens could show."

— 1. Johnson Cañon, Panamint Range. A park foreman at headquarters in Death Valley told one of his men that Dr. Jepson and Prench Gilman had been in Johnson Cañon at Shadscale Spring for two weeks, and then thoughtfully added: "I bet those two old buzzards are having the time of their young lives botanizing down there." cf. Men and Manners, vol. 13, p. 401.

– B. B. Wolf says: "I went up canon behind Bonanza King Mine, Providence Mts. to find Phacelia stephensi three or four times. Did not find it. One might easily miss a plant in the desert, by looking on one side of a rock and not looking on other side. At one time I went clear to summit of the range. On this trip I found a Glossopetalon in a colony, not before found in the Providence Mts. If, however, I had walked twenty-five feet to the left it would have been missed." – Feb. 26, 1943

– Distinguish, in describing plants in the field, the difference between describing the individual and the species. It may be desirable or necessary in the field to describe in detail

the individual; but observe that describing the species is a quite different matter; an individual; vs. a species.

– In the Flora Boreali-Americana, vol. 1, p. 229, W. J. Hooker describes no genus of Cactaceæ, no species. He writes: "It is greatly to be regretted, that of this interesting family, from the impossibility of drying them, no specimens were collected" (1834).

Field Collecting.

Seldom have I bought plants. Economically it is like putting money down a drain. One could never salvage any money from such an investment. It is always better, always, to go into the field one's self. One learns so much more about the plant, vastly more, by making one's own collections.

— In 1919 W.S. Cooper was working on the sand dune plants of the Pacific Coast; in that year and in several years following as I remember, his plant spms. were sent me for determination. They were wretched specimens. Either the plant was neither in flower or fruit; or maybe too young; or too old; or sometimes in good flowering or fruiting condition; — but in almost every case the material was scanty, — scanty beyond belief, even when the plant was in good condition to be taken.

Cooper is an able botanist, an able ecologist, and a most likeable man. Perhaps for these reasons I went ahead and determined his miserable specimens as best could be done. They should not have been

touched by me. It was a waste of time to attempt to rest critical determinations on so frail a basis. Moreover, Cooper had not, I am sure, the slightest idea that determinations are costly; he had no conception of the vast amount of time that must be spent on naming such a collection as his. — July 31, '44.

For lists of determinations sent him (W.S. Cooper) see Jepson Correspondence, vol. 32, p. 171.

— In 1934, Lincoln Constance made a collection of plants on Bull Creek, Humboldt Co. The collection was a fine one. See his letter, June 27, 1934, in Jepson Correspondence.

— Variation in Artemisia vulgaris. Growth form. cf. M. L. Fernald, in Rhod. 47: 248-249. 1945.

— "Field experience ... has demonstrated .... that too often plants growing side-by-side will differ very strikingly in the degree of pubescence or its length on stem and calyx and that, to some extent, the specimens from a single small colony have to be arbitrarily sorted in order that, those of a single number may be tolerably uniform." — M. L. Fernald, in Rhod. 47: 1-1945. — re Ruellia in Virginia.

— Directions to Reid Moran, in Jepson Corr. vol. 46. Jan. 30, 1941.

— Skimpiness of material. cf. Systematic Botany notebook, vol. 1, p. 73.

— Collins, J. F., The use of corrugated paper boards in drying plants. Rhod. 12: 221-224. (1910).

— cf. F. B. 51:156.

— cf. F. B. 58: 413.

— Blue Witch. cf. F. B. 61:81.

— Preservation of colors in flowers. cf. Jour. Wash Acad. Sci 29:272.

— If one is to make a serious effort to study the species of plants one must keep a record of them. — L. H. Bailey, Man. Cult. Plants, p. 13. 1924.

The habit of critical study of them cannot be developed in living specimens alone. — L. H. Bailey, Man. Cult. Plants. p. 13

— If long long series of specimens were made in a given locality — not taking merely the finest individuals looking but a range of individuals showing all possible variations there would not be so much species splitting perhaps.

Itinerary

An itinerary must be kept and with it associated notes or descriptions of topography, daily weather, camping spots, rivers and ridges crossed, behavior of the animals of a pack train, food, fodder, general vegetational aspects and detailed lists of species, wild animals or birds and their migrations or localized movements — these and a hundred other subjects or field incidents may be made into a highly engaging narrative, both valuable as a record and engaging as literature. Explorers should learn to write well if it be in them to do so. To write well they must have something to say. To have something to say the field of their inquiry in all its aspects must be studied deeply,

must be known, — the facts and relations of it must saturate the mind; one must learn to think well and clearly. To write well one must not merely have something to say; it must be something you want to say. With all this foundation a personal style in writing may be developed — a most precious and individual thing, an individual possession. A real belief in something; the courage to say it; an utter devotion to truth — these make style. "Vague ideas, vague emotions, do not lead to truth". One must be convinced of what he is telling, says Freya Stark, The test of a stylist, says Gustave Flaubert, is to describe one tree in a forest so it cannot be mistaken for any other tree. If well done a field narrative may not only be useful factually but also give pleasure to the reader. What

an unexcelled picture of the great Amazon River land is presented by Bates in his

- Recording exact locality. When so recorded, sometimes not used. cf. Bot. Cal. & W. Am. 1: 86, 88.
- Asa Gray, not a field student. cf. Bot. Cal. & W. Am. 2: 100.
- Brand, A. T. F. Macbride associates Brand for his work on either W. Am. hydrophylls or gilioids (see Contrib. Gray Herb. c. 1918). But Brand had no field experience; he worked on W. Am. groups from very scanty collections which did not afford him any just idea of normal variation in a species. particular.
- The value of opus. for reference in relation to horticultural progress. cf. E. J. Alexander, Jour. N. Y. Bot. Gard. 42: 75.

- Species overlooked in the field. cf. Systematic Botany Note Book, p. 66.
- Incomplete Material. cf. Systematic Bot. notebook, p. 70.
- Cont. from p. 54 at *. Why do not know how to tie in their original ideas and clever thoughts to actual specimens and record good data. Doubtless their brilliant ideas might be toned down a bit by rigid application to the actual plant parts and maybe instinctively they shrink from that.
- Field describers of the plant tend to put down the unusual or exceptional or rare condition but failing to note the usual or prevailing state of the plant. cf. Sys. Bot. notebook, 2: 1.
- Injury to Herbarium-Specimens by extreme Heat. M. L. Fernald. Rhod. 47: 258.

Companions in the Field

One may at times have fellow botanists in the field. They may be guests from east of the Rockies. Naturally they differ. Frequently a botanist is a guest whose every question I can answer. On the other hand an occasional guest may put one in a reverse position. One such guest was Dr. Edgar Anderson, Engelmann Professor of Botany in Washington University. Eager minded with an alert interest and writing in most plants met in the field, he asked some questions for which I had no instant answer. I took him on a field trip to Mount Diablo. It was a vast advantage to have one's mind stirred by questions unexpected, by questions from a new angle or in a new field or unfrequented by-paths. cf. letter to Dr. H.M. Wheeler, May 28, 1943. Anderson's interest

was so zestful that his company was a great stimulation. He was busy every moment of the time!

— The living plant in the field or in the garden is the most proper subject of study; it is the most useful subject; it is, by and large, the most fruitful subject. It is an inspiration and large resource. And yet the living plant is not sufficient in and by itself. One cannot depend upon it exclusively. Dried specimens, preserved material must be made, because there must be something permanent on which one's records, one's facts may rest, which one may continually go back to for comparisons, for further examination, for refreshment of one's memory.

Passes of the Sierra Nevada

— cf. F.B. 29:9.

— Permits.

cf. Letter to C. E. Durrell, Sept. 8, 1941.

— A former student depicts me in the field. — cf. Mrs. Jas. Clark in litt. June 11, 1941." Meeting and talking with you on a Berkeley hillside with a branch of freshly budding Buckeye in your hand."—

— Days afield with students. cf. letter of Mrs. L. H. Clark, Dec. 7, 1940 in Jepson Corr.; my letter in reply Jany. 1, 1941.

— cf. Index to Field Books, vol. 4, sub "Plant Collecting and Field Work".

— Making camp early. F. B. 52:99.

— Lure of the field, love of nature and out-of-doors is a trait that may be inherited. While traveling along the South Fork Eel River, in Leggett Valley, my friend Dr. K. M. Wiegand said that on a trip to Labrador there was in the party (Cont. p. 171)

- Geographic Terms. cf. Types and Original Citations Notebook, 2: 183.
- Importance of specific locality, Types and Original Citations, 2: 173, 174.
- Field Records. Linnaeus. Types and original Citations Notebook, 169. Etc.
- Gambel, Wm. and Thos. Nuttall. cf Types and Original Citation Notebook, vol. 2, p. 161.
- Cf. "Types and Original Citations" notebook, vol. 1, p. 22. "Insufficiency of early records", - A. S. Skan.
- Bot. Explor. Mexico. cf. l.c. 1
- Collecting plants as records. l.c. 1: 64.
- Amos Eaton, note on field collecting, cf. Types and Orig. Citations, p. 173, vol. 1.
- Importance of an herbarium. - E. Regel, Gartenfl. 22: 134.
- Herbarium of Sir Joseph Banks, cf. Types and orig. cit. 1: 94.
- De Candolle, Phytographia. cf. Types and Orig. Cit. vol. 1, p. 156.

- Directions for collecting. cf. "Types and Orig. Citations", vol. 1, p. 22.
- Specific locality. cf. l.c. " ", p. 80.
- Field records. cf. Types and orig. Citations, vol. 2, p. 169.
- Specific locality for specimens: absence of. cf. "Types and Orig. Citations", vol. 1, p. 174; vol. 2, p. 175; vol. 2, p. 178. Also see index sub "Types".
- Linnaeus, C. cf. Types and Orig. Citations, vol. 2, p. 183.
- Asa Gray's idea as to importance of the flower in a spec. Gray names Astragalus reventus Gray after study of it for 39 years. cf. Types and Orig. Citations, 2: 38-43.
- cf. Verta Hesse, in litt. Jan. 12, 1941. In Jepson Correspond., vol. 46.
- Incomplete specimen. What parts are lacking that are essential would vary with the group.

- cf. F. B. 37:52.
- The matter of a single individual: cf. F. B. 50; 71.
- Preservation of plant color in plant specimens (Tour. Wash. Acad. Sci. 29: 272).
- Ottawa Naturalist, 3:146.
- cf. Typ. Bot. note book, 1:83. (Mrs. Price wanted to exploit the nature study field in botany, but she did not want to do any real work in mastering even elementary botanical principles; she wanted the names of native plants but was not ready to do the work involved in making specimens for determination. Slovenliness, superficiality, the craving for the sensational side in plant life — all this is far away from the sound painstaking steadiness of the precise and definite findings that are necessary in making records in systematic botany work.
- If my field work could be done over again, I would take more detailed notes of the living plant — more notes and more notes — notes of the obvious really. One is in the field. There the plant is. It is in flower. The position of the flower is so obvious. The position of the parts and their structure are so obvious; color of parts; habit of the plant; line; its associates. All so obvious before one. There is an impression of the mind, subconscious maybe, that all this, so obvious, can be remembered. It cannot be. Such matter must be factually recorded to be useful.

— Plants growing in shade, of a species commonly growing in the open, should always be collected, especially if in deep shade. Such plants are often highly illustrative of the plant growing under varying conditions, frequently most instructive.

— Asa Gray. I always suspected Asa Gray knew nothing about N. Am. plants in the field by field experience. His Manual sounds that way. It contains nothing which indicates he himself had explored the region of which it treats. It is an excellent Manual; it is a famous Manual; but its excellence is due to the genius of Asa Gray — a genius which, however, was not supplemented or given direction by penetrating the woods, climbing the mountains or ferreting out plants in swamps or meadow land. Many years later my ideas on this head were confirmed by a remark from M. L. Fernald, Fisher Professor of Natural History in Harvard University who said that Asa Gray did not really know first hand the field flora

of northeastern North America. This remark has significance because no one has ever surpassed M. L. Fernald in field knowledge of the flora of New England, eastern Canada and Newfoundland.—
Feb. 26, 1944.

— Theophrastus. Historia Plantarum. Contains suggestions for inspiring the young student in the field. Which may be used

— Munz, P. A., Castilleia (affinis). "top of dry ridge 35 mi. e. of Paso Robles".

— Botanizing in marshes. F. B. 39:3.

— Do not assume small plants or small individuals are necessarily starved or dwarf or depauperate. Orthocarpus micranthus was passed by perhaps by collectors that assumed it was a starved state of O. erianthus. That was one of the smart things E. L. Greene did. He recognized, in the field, this

micranthus as a distinct entity.

— Sloppy indication of locality: —"30 mi. W. of Wasco". (Proc. Cal. Acad. ser. 4, 16: 541).

— "Fields along Highway #152 10 miles west of Highway # 99 on road to Los Banos. Madera Co". Label of Orthocarpus purpurascens Bth. Ira L. Wiggins. But Los Banos is in Merced Co. and a long long way from any possible station in Madera Co.

— Cont. from bottom p. 163, a Bartram and a Darlington, descendants of the famous botanists of those names. cf. F. B. 39:20.

— cf. letter to Mrs. Paul de Decker, Independence, Cal., June 20, 1944.

— re. Parry plants. cf. Types and Orig. Citations, vol. 2, p. 189.

— Lemmon's labels, F. B. 51:189.

— Injury to Herbarium Specimens by Extreme Heat. M. L. Fernald. Rhod. 47:258.

– A great lapse of collectors is failure to add his own name to a collection. Purpus (C.A.) sent excellent collections of his own collecting, with good labels, to Mr. and Mrs. T. S. Brandegee, but sometimes such a collection would have labels not bearing his own name. For example a collection from the southern Sierra Nevada (it included Pentstemon palmeri var. grinnellii, no. 1372, Purpus, Aug., 1895.). The Brandegees were, unfortunately, incapable of adding his name to the labels.

An excellent collection of plants came to me from Jos. Grinnell, collected in Lassen Co. in 1928. The folders carried full data: station, county, date, habitat, altitude. But not Grinnell's name as collector,

though he was the collector. I added his name as collector.

– On beginning collection, when very young, the directions available told me to put down what I saw. While I saw a good deal, I did not know what to put down. I did not know what was important. So, I recorded little. In later years I saw so much there was not time enough in a day or a year to get it all recorded in my field book. It was best for the beginner to describe the habit of the plant, its size, its mode of growth, its associates. And also such features of the flower or fruit as may not be preserved or well-preserved for convenient observation in drawing. Field records should be made for use. As soon as the

beginner uses them, he finds his backs in field observing. That is the best way.

One of the most difficult things to do is to record the obvious — such as the height of a plant or shrub.

— There has just come this summer, for the first time, bundles of dried California native plants from Miss Annie Alexander. She makes most excellent and useful specimens botanically and they are also beautifully prepared. On seeing them one's imagination and interest is stirred. By using them one's diagnoses are strengthened and vitalized; it is nearly like using living plants! Most of her material can be used without soaking up

parts, so closely does it come to fresh or living plants. See my letters to Miss Alexander in 1944 file.

The color of the specimens in Miss Alexander's plants, is very fine, that is the color seems in nearly all cases to be a natural color — leaves, stems, inflorescence, corolla.

I myself do not expect much about color save as a gift from the Gods. In so far as color can be managed by careful attention to drying well and good. That much, as I say, is a gift of the Gods. Anything beyond that is either futile or a waste of energy on a vast scale. Highly elaborate means, costly in time, can be taken to preserve refractory colors or shades. No effort of

time would ever be dissipated in that way, because, however admirable the end result, color is of too slight importance scientifically to warrant such extensive labors. Cf. my letter to Dr. H. M. Wheeler, Aug. 31, 1944.

— "It is a waste of time taking poor specimens; it is a waste of time being interested in plant relationships and deciding not to take any specimens." — H.M. Wheeler, in litt. Sept. 11, 1944.

— Messrs Hall and Harbour when distributing their 1862 plant collection from the Rocky Mountains of Colorado sometimes used the same number for collection of things that were different. Wrote Asa Gray: "The collectors appear to have been somewhat too fearful of distributing the same species under two or more numbers; but the opposite course, in case of doubt, is preferable. Even well-marked varieties had better be kept separate in distributed collections." — Proc. Acad. Nat. Sci. Phila. 1863: 56.

— Collecting. H.M. Wheeler, Letters Aug. 30, Aug. 31, Sept. 11, 1944.

— The color of the flower, of the corolla should be set down in one's field book in the field. This feature is not of much importance as a character and yet it has interest. Frequently I myself do not make note. Why? Partly because it is easy to overlook, or fail to make record of the obvious. Secondly because, perhaps, I would not place but very slight weight on color a character.

I would be ashamed to stress color as a character. That is to descend to the unscientific level of the "wild flower" books. And yet when descriptions were written for a species or the color was needed and the specimen seldom showed it properly. I am reminded of a story. When the outing party of the Sierra Club goes into the high mountains the luggage of each member is limited to thirty or thirty-five pounds including sleeping bag. No luxuries, no redundancies can come along. All such impedimenta are under tribal taboo of the most inhuman kind. It is an honor to look like a tramp. One day, Lila McKinney, a neat young person, said to me: "I would not for worlds bring a clothes

brush, — but I'd be ashamed to do so, I'd like awfully to borrow one from a friend!"

So it happened once in a while in the field that color was not recorded — unconsciously overlooked — and then I was compelled to borrow the color from some one else! It is not easy to put down in one's notebook the obvious. One writes down after minute examination many morphological details, especially of the flower, which are or may be subject to distortion in drawing. All recondite or obscure things which have to be worked out with care. But height or branching of the plant is or may be neglected. It is so obvious. There it is right before you. How could one ever forget the height? And

Yet one must make record if his observations are to have any value. Sometimes peculiarities of branching have marked genetical values.

Faked Specimens

- cf. my letter to C. N. Smith, 1-9-'45.
- see Index to Field Books.

Passing Over Plants as Immature or as "Stunted" or Dwarfed.

- As immature: cf. F. B. 52:61.

— Some botanists are citing collection stations by highway numbers which is both difficult and unfortunate, since numbers are often changed. For confusing change of number see W.I. Follett in litt. May 12, 1942. Botanical collectors should keep to the long-approved and tried method of citing a locality which is simplicity itself. Cont. p. 185.

— Variation in form due to ecological causes or unfavorable or favorable conditions: R. F. Hoover collected Mimulus glaucescens Greene 3 mi. n. of Chico: no. 3248, beautiful vigorous spms. with large corollas and bright fine calyces. No. 2235, less vigorous individuals with smaller corollas, duller calyces, smaller leaves — and yet with all the technical characters of the species.

— Put down in your note book all you can see; all you can see for yourself; all about the plants and its habitat. Do not look into the manual until you have done this. You must learn to see for yourself, to see what is important. The book can help you only if you try for yourself first. No one can tell you what to look for as to truly new things because no one has seen those things before. "Learn what to look for, what to put down." — H.M. Wheeler in litt. Feb. 2, 1945.

— Number your plant folders in the field, record the number in your field book, with place of collection, and date of collection. Do not fail to set down the genus name or the full binomial if known, or at least some indication of what the plant is as a check. Just

now I chanced across a folder containing Cordylanthus tenuis Gray. There was no label in the folder, but the collector's number "5307" (Hoover) was properly marked on outside of folder. When I looked up the number in the Hoover Field Book to get the data for a label two queries developed:

1. The locality was Monte Rio (2 mi. se.) in Sonoma Co., an impossible station for this species.

2. The date of collection was June 7 (1941), a date much too early for Cordylanthi of this section.

Prob. C. capillaris Penn. of that region — R.H. 1972

The Field Book showed an obvious lack of data: there was no indication, even in an approximate way, as to what no.

5307 as collected that day was: no genus name; no family name; no common name as a check, to show if there had been a slip in some way in numbering.

— Drying plants. cf. F.B. 18:79.

— The field man must develop those intellectual faculties of discernment and discrimination which enable him to recognize fundamental similarities or fundamental differences and evaluate them; he must have an imagination which gives him the power to bring into association or comparison in his mind things widely separated in space or time.

— Cont. from p. 182. For the sake of accuracy, for the sake of clearness, for the sake of intelligibility and convenience keep to conservative ways in citing locality.

"The mere animal pleasure of traveling in a wild, unexplored country is very great. When on lands of a couple of thousand feet, brisk exercise imparts elasticity to the muscles, fresh and healthy blood circulates through the brain, the mind works well, the eye is clear, the step is firm, and a day's exertion always makes the evening's repose thoroughly enjoyable.

The effect of travel on a man whose heart is in the right place is that the mind is made more self-reliant: it becomes more confident of its own resources - there is greater presence of mind. The body is soon well-knit; the muscles of the limbs grow as hard as a board and seem to have no fat; the countenance is bronzed, and there is no dyspepsia. No doubt much toil is involved . . . . , but the

sweat of one's brow is no longer a curse . . — . . ; it proves a tonic to the system and is actually a blessing."

— David Livingstone. Taken from the Times Literary Supplement, Dec. 15, 1945. 44: 594.

— Cont. from p. 34. from his great work, "Human Proportion". cf. London Times, 45: 62. 1946.

Poor Recording of Locality

— Pentstemon antirrhinoides Bth., mountains between San Diego and Imperial. P. B. Kennedy. June, 1917.

— One of the ablest collectors ever in California is Dr. B. T. Hoover. Ablest in the sense that he had a trained eye for material of importance, either as new kinds, as showing extremes of variability, as showing extensions of range or as showing features of life-history. He liked to make specimens of good length and used folders 17 inches long which is as may be a half inch too long for a standard mounting sheet.

— "Keys .... are numerous and ... satisfactory. .... though it is a well-known fact that there must be a certain number of always plants that will exhibit misleading or confusing characters to baffle any collector." — R. M. Whelden, on Gilbert Smith's Marine Algae of the Monterey Peninsula. Rhod. 47:63. 1945.